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EXAMINER	
ZERVIGON, RUDY	

ART UNIT	PAPER NUMBER
1792	

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10/02/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/925,579	NAKANO ET AL.	
	Examiner	Art Unit	
	Rudy Zervigon	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 July 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-8,64,65,67,68,71-78,81 and 83-87* is/are pending in the application.

4a) Of the above claim(s) *2-8,64,65,67,68 and 71-74* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *74-78,81 and 83-87* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 2, 2009 has been entered.

Claim Rejections - 35 USC §/103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 74-79, 81, 85-89 are rejected under 35 U.S.C. 103(a) as obvious over Murata et al (USPat. 5,423,915) and Patrick (USPat. 5,474,648) in view of Stramke (USPat. 4,645,981). Murata teaches a plasma processing apparatus (Figure 1; column 5; line 44 - column 6; line 11) comprising: a plasma processing chamber (1; Figure 1; column 5; line 44 - column 6; line 11) having a plasma excitation electrode (2; Figure 1; column 5; line 44 - column 6; line 11) for exciting a plasma; a radio frequency generator (4; Figure 1; column 5; line 44 - column 6; line 11) for supplying a radio frequency voltage to the electrode (2; Figure 1; column 5; line 44 - column 6; line 11); a radio frequency feeder (105; Figure 1; column 5; line 44 - column 6; line 11) connected to the electrode (2; Figure 1; column 5; line 44 - column 6; line 11); a matching circuit (104; Figure 1; column 5; line 44 - column 6; line 11) having an input terminal (104/4 interface; Figure 1; column 5; line 44 - column 6; line 11) and an output (106, 109; Figure 1;

column 5; line 44 - column 6; line 11) end, wherein the input terminal (104/4 interface; Figure 1; column 5; line 44 - column 6; line 11) is connected to the radio frequency generator (4; Figure 1; column 5; line 44 - column 6; line 11) – claim 74.

Applicant's claim 74 limitations of

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a set of electrical radio frequency factors of the plasma processing chamber configured such that three times a first series resonant frequency f0 of the plasma processing chamber, is larger than a power frequency fe of the radio frequency voltage, wherein the first series resonant frequency f0 corresponds to a minimum impedance of the plasma processing chamber.

"

And all of claims 88 and 89 appear to be a claim recitation of intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

Murata further teaches that at least one of the shape of a feed plate (105; Figure 1; column 5; line 44 - column 6; line 11), the overlap area (column 8; lines 45-59) of the plasma excitation electrode and a chamber wall, insulation material between the plasma excitation electrode and the chamber wall, or the capacitance (column 8; lines 45-59) between a susceptor electrode and

the chamber wall are considered result-effective variables for film thickness distribution and film forming speed as taught by Murata (column 8; lines 45-59).

Applicant's following claim limitations, not taught by Murata, but are also are believed to be intended use requirements of the pending apparatus claims:

i. The plasma processing apparatus (Figure 1; column 5; line 44 - column 6; line 11) according to claim 74, wherein a frequency of 1.3 times the first series resonant frequency f0 is larger than a power frequency fe, as claimed by claim 75

ii. The plasma processing apparatus (Figure 1; column 5; line 44 - column 6; line 11) according to claim 75, wherein the first series resonant frequency f0 is larger than three times the power frequency fe, as claimed by claim 76

iii. The plasma processing apparatus (Figure 1; column 5; line 44 - column 6; line 11) according to claim 76, wherein a series resonant frequency f0' which is defined by a capacitance between the plasma excitation electrode (2; Figure 1; column 5; line 44 - column 6; line 11) and a counter electrode (2; Figure 1; column 5; line 44 - column 6; line 11) for generating the plasma in cooperation with the plasma excitation electrode (2; Figure 1; column 5; line 44 - column 6; line 11), is larger than three times the power frequency fe, as claimed by claim 77

iv. The plasma processing apparatus (Figure 1; column 5; line 44 - column 6; line 11) according to claim 77, wherein the plasma excitation electrode (2; Figure 1; column 5; line 44 - column 6; line 11) and the counter electrode (2; Figure 1; column 5; line 44 - column 6; line 11) are of a parallel plate type, and the series resonant frequency f0' and the power frequency fe satisfy the relationship:

$f_0' > \sqrt{\frac{d}{\delta}} f_e$ wherein d represents a distance between the plasma excitation electrode (2; Figure 1; column 5; line 44 - column 6; line 11) and the counter electrode (3; Figure 1; column 5; line 44 - column 6; line 11), and δ represents a sum of a distance between the plasma excitation electrode (2; Figure 1; column 5; line 44 - column 6; line 11) and a generated plasma and a distance between the counter electrode (3; Figure 1; column 5; line 44 - column 6; line 11) and a generated plasma, as claimed by claim 78.

Murata further teaches a plasma processing apparatus (Figure 1; column 5; line 44 - column 6; line 11) comprising: a plasma processing chamber (1; Figure 1; column 5; line 44 - column 6; line 11) having a plasma excitation electrode (2; Figure 1; column 5; line 44 - column 6; line 11) for exciting a plasma and a first series resonant frequency f0; a radio frequency generator (4; Figure 1; column 5; line 44 - column 6; line 11) for supplying a radio frequency voltage to the electrode (2; Figure 1; column 5; line 44 - column 6; line 11); a radio frequency feeder (105; Figure 1; column 5; line 44 - column 6; line 11) connected to the electrode (2; Figure 1; column 5; line 44 - column 6; line 11); and a matching circuit (104; Figure 1; column 5; line 44 - column 6; line 11) having an input terminal (104/4 interface; Figure 1; column 5; line 44 - column 6; line 11) and an output (106, 109; Figure 1; column 5; line 44 - column 6; line 11) end, wherein the input terminal (104/4 interface; Figure 1; column 5; line 44 - column 6; line 11) is connected to the radio frequency generator (4; Figure 1; column 5; line 44 - column 6; line 11) and the output (106, 109; Figure 1; column 5; line 44 - column 6; line 11) end is connected to an end of the radio frequency feeder (105; Figure 1; column 5; line 44 - column 6; line 11) so as to achieve impedance matching between the plasma processing chamber (1; Figure 1; column 5; line 44 -

column 6; line 11) and the radio frequency generator (4; Figure 1; column 5; line 44 - column 6; line 11) – claim 85

Murata further does not teach:

v. a measuring terminal for measuring a resonant frequency of the plasma processing chamber (1; Figure 1; column 5; line 44 - column 6; line 11) in the vicinity of an end of the radio frequency feeder (105; Figure 1; column 5; line 44 - column 6; line 11); a switch positioned between the radio frequency feeder (105; Figure 1; column 5; line 44 - column 6; line 11) and the measuring terminal, the switch having a first configuration comprising a connection between the end of the radio frequency feeder (105; Figure 1; column 5; line 44 - column 6; line 11) and the output end of the matching circuit and a second configuration comprising a connection between the end of the radio frequency feeder (105; Figure 1; column 5; line 44 - column 6; line 11) and the measuring terminal, the first configuration corresponding to a plasma excitation mode of the chamber (1; Figure 1; column 5; line 44 - column 6; line 11) and the second configuration corresponding to a measuring mode of the chamber (1; Figure 1; column 5; line 44 - column 6; line 11) - claim 74, 85

vi. The plasma processing apparatus (Figure 1; column 5; line 44 - column 6; line 11) according to claim 74, further comprising a resonant frequency measuring unit which is detachably connected to the measuring terminal, as claimed by claim 81

vii. wherein at least one of the *shape* of the radio frequency feeder (105; Figure 1; column 5; line 44 - column 6; line 11), an overlapping area of the plasma excitation electrode (2; Figure 1; column 5; line 44 - column 6; line 11) and a chamber wall, a thickness of

insulation material between the plasma excitation electrode (2; Figure 1; column 5; line 44 - column 6; line 11) and the chamber wall, **and** a capacitance between a susceptor electrode (2; Figure 1; column 5; line 44 - column 6; line 11) and the chamber wall is adjusted such that three times the first series resonant frequency fo is larger than a power frequency fe supplied from the radio frequency generator (4; Figure 1; column 5; line 44 - column 6; line 11) – claim 85

viii. The plasma processing apparatus (Figure 1; column 5; line 44 - column 6; line 11) according to claim 85, wherein at least one of the *shape* of the radio frequency feeder plate (105; Figure 1; column 5; line 44 - column 6; line 11), the overlapping area of the plasma excitation electrode (2; Figure 1; column 5; line 44 - column 6; line 11) and the chamber wall, the thickness of the insulation material between the plasma excitation electrode (2; Figure 1; column 5; line 44 - column 6; line 11) and the chamber wall, and the capacitance between the susceptor electrode (2; Figure 1; column 5; line 44 - column 6; line 11) and the chamber wall is adjusted such that 1.3 times the first series resonant frequency f0 is larger than the power frequency fe, as claimed by claim 86.

ix. The plasma processing apparatus (Figure 1; column 5; line 44 - column 6; line 11) according to claim 86, wherein at least one of the *shape* of the radio frequency feeder plate (105; Figure 1; column 5; line 44 - column 6; line 11), the overlapping area of the plasma excitation electrode (2; Figure 1; column 5; line 44 - column 6; line 11) and a chamber wall, the thickness of the insulation material between the plasma excitation electrode (2; Figure 1; column 5; line 44 - column 6; line 11) and the chamber wall, and the capacitance between a susceptor electrode (2; Figure 1; column 5; line 44 - column 6;

line 11) and the chamber wall is adjusted such that the first series resonant frequency fo is larger than the power frequency fe, as claimed by claim 87

Patrick (USPat. 5,474,648) teaches a plasma reactor (104, Figure 2a; column 6; line 54 – column 7; line 25) including a variable RF parameter sensor (202; Figure 2a) which measures power, voltage, current, phase angle, harmonic content (abstract), and impedance parameters at the plasma chamber electrode (112; Figure 2a, claim 5). That Patrick et al measures a frequency, resonant or otherwise, at the plasma chamber electrode is inherent because the applied frequency is that of the dynamic voltage and current that are measured and dynamically controlled (claim 6). The Examiner believes Patrick's apparatus is inherent in setting a frequency f_0 corresponding desired, or optimized values, including "corresponding" a minimum impedance (as measured by Patrick) of the plasma processing chamber. That Patrick can measure the minimum impedance with the plasma chamber disconnected from the plasma apparatus during a non-discharge period, is a claim requirement of intended use. See above.

Patrick further teaches that his plasma processing apparatus (Figure 2a; column 6; line 54 – column 7; line 25) produces frequencies which is defined by a capacitance between the plasma excitation electrode (112; Figure 2a) and a counter electrode (114; Figure 2a) for generating the plasma in cooperation with the plasma excitation electrode (112; Figure 2a). Further when the structure recited in the references is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent. Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has

been established. In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA1977) – MPEP 2114.

Applicant's claim 74 limitations of "the first configuration corresponding to a plasma excitation mode of the chamber and the second configuration corresponding to a measuring mode of the chamber" are claim requirements of intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

Stramke teaches a capacitive plasma processing apparatus (Figure 1; column 3; line 57 – column 4, line 19) including a switch ("S1"; Figure 1; column 3; line 57 – column 4, line 19) for a current sensor (12; Figure 1; column 3; line 57 – column 4, line 19).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Murata to use Patrick et al's system for plasma dynamic control including optimizing the relative frequencies between Murata's plasma excitation electrode and Murata's radio frequency generator depending on the geometry of the plasma chamber and dynamic processing conditions.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Murata and Patrick to add a switch to the RF parameter sensor as taught by Stramke.

Motivation for Murata to use Patrick et al's system is for plasma dynamic control including optimizing the relative frequencies between Murata's plasma excitation electrode and Murata's radio frequency generator depending on the geometry of the plasma chamber and dynamic processing conditions is for enabling the repeatability and uniformity of plasma processing as taught by Patrick et al (column 3; lines 55-65) and Murata (column 8; lines 45-59).

Motivation for Murata and Patrick to add a switch to the RF parameter sensor as taught by Stramke is to allow for current sampling durations as taught by Stramke (column 4; lines 46-50).

It would be obvious to those of ordinary skill in the art to optimize the operation of the claimed invention (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); In re Hoeschele , 406 F.2d 1403, 16_0 USPQ 809 (CCPA 1969); Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 1_0 USPQ2d 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989); In re Kulling , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990), MPEP 2144.05).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Murata to optimize the size/dimension of Murata's apparatus.

Motivation for Murata to optimize the size/dimension of Murata's apparatus is for plasma dynamic control including optimizing the relative frequencies between Murata's plasma excitation electrode and Murata's radio frequency generator depending on the geometry of the plasma chamber and dynamic processing conditions is for enabling the repeatability and uniformity of plasma processing as taught by Murata (column 8; lines 45-59). Further, it is well established that changes in apparatus dimensions are within the level of ordinary skill in the art.(Gardner v. TEC Systems, Inc. , 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert.

denied , 469 U.S. 830, 225 USPQ 232 (1984); In re Rose , 220 F.2d 459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); See MPEP 2144.04)

4. Claims 83 and 84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murata et al (USPat. 5,423,915), Patrick (USPat. 5,474,648), and Stramke (USPat. 4,645,981) in view of Hoke; William E. et al. (US 5077875 A). Murata, Patrick, and Stramke are discussed above.

Murata, Patrick, and Stramke do not teach:

i. The plasma processing apparatus (Figure 1; column 5; line 44 - column 6; line 11) according to claim 74, wherein the plasma excitation electrode (2; Figure 1; column 5; line 44 - column 6; line 11) comprises an overlapping area with respect to the chamber wall, the overlapping area *adapted* to set the first series resonant frequency f0 such that three times the first series resonant frequency f0 is larger than a power frequency fe supplied from the radio frequency generator (4; Figure 1; column 5; line 44 - column 6; line 11), as claimed by claim 83.

ii. The plasma processing apparatus (Figure 1; column 5; line 44 - column 6; line 11) according to claim 74, wherein the radio frequency feeder (105; Figure 1; column 5; line 44 - column 6; line 11) has a length *adapted* to set the first series resonant frequency fo such that three times the first series resonant frequency f0 is larger than the power frequency fe, as claimed by claim 84

Hoke teaches a cross flow deposition reactor (Figure 3) similar to Murata's cross flow deposition reactor (7; Figure 1). In particular, Hoke teaches a shower plate (12; Figure 3) at the gas introduction point (15; Figure 3) in the reactor (11; Figure 3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Murata to use Patrick et al's system for plasma dynamic control including optimizing the relative frequencies between Murata's plasma excitation electrode and Murata's radio frequency generator depending on the geometry of the plasma chamber and dynamic processing conditions, further, for Murata and Patrick to add Hoke's shower plate (12; Figure 3).

Motivation for Murata to use Patrick et al's system for plasma dynamic control including optimizing the relative frequencies between Murata's plasma excitation electrode and Murata's radio frequency generator depending on the geometry of the plasma chamber and dynamic processing conditions is for enabling the repeatability and uniformity of plasma etching processes as taught by Patrick et al (column 3; lines 55-65), motivation Murata and Patrick to add Hoke's shower plate is for process gas diffusion under laminar flow as taught by Hoke (column 7; lines 54-65).

It would be obvious to those of ordinary skill in the art to optimize the operation of the claimed invention (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); In re Hoeschele , 406 F.2d 1403, 16_0 USPQ 809 (CCPA 1969); Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 1_0 USPQ2d 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989); In re Kulling , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990), MPEP 2144.05).

Response to Arguments

5. Applicant's arguments filed July 2, 2009 have been fully considered but they are not persuasive.

6. Applicant's arguments are stirictly directed to the amended claim features and are likewise addressed in the context of the new grounds of rejection as offereed above.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Friday schedule from 9am through 5pm. The official fax phone number for the 1792 art unit is (571) 273-8300. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272-1435

/Rudy Zervigon/

Primary Examiner, Art Unit 1792